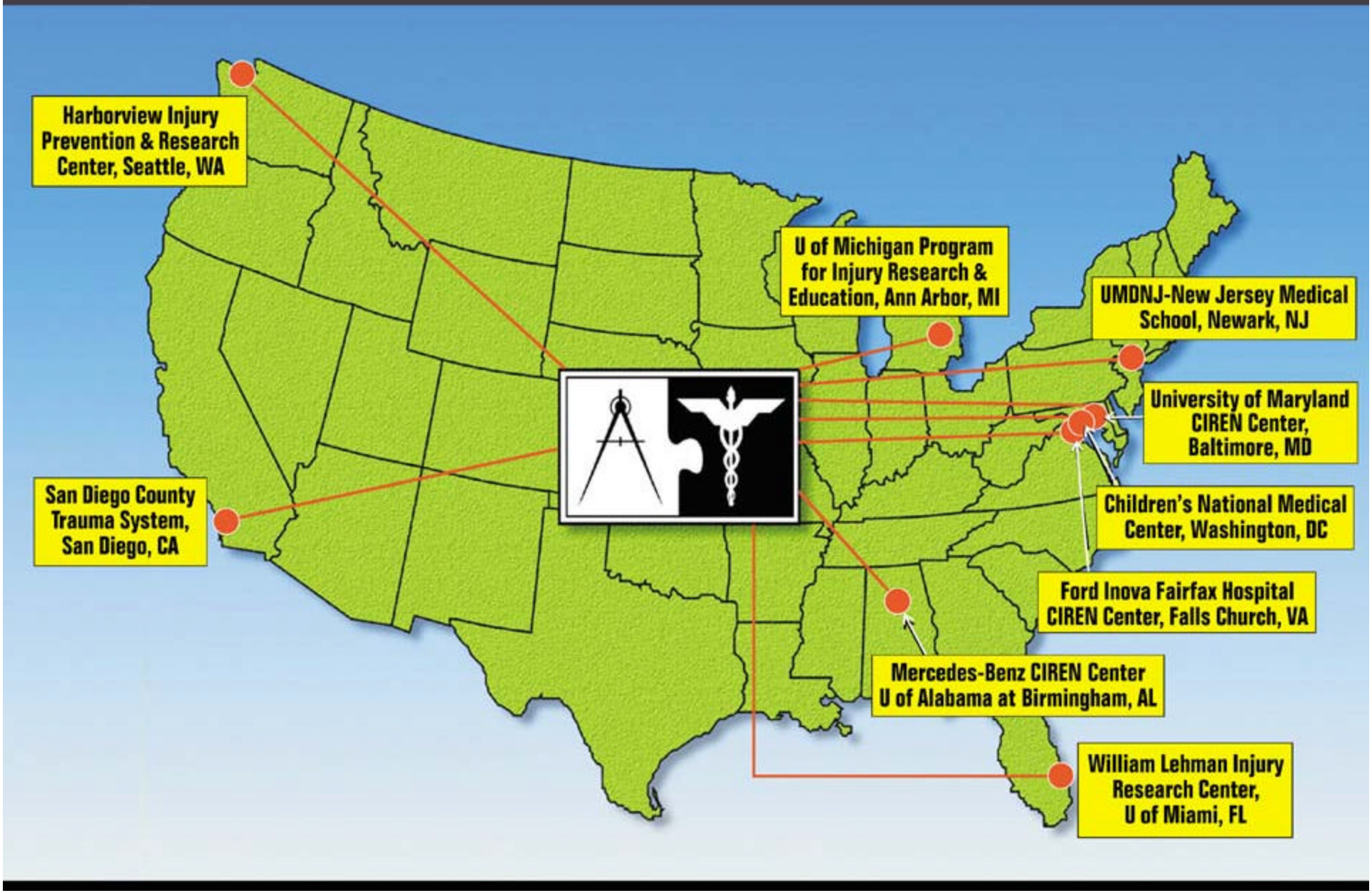
NHTSA
People Saving People
www.nhtsa.dot.gov

CIREN Network



Real-Life Injuries in Offset Frontal Collisions

A. Brent Eastman, MD, FACS

Steve Erwin

San Diego CIREN Team

March 16, 2001

SAN DIEGO CIREN PROGRAM

Principal Investigators

Gail F. Cooper- San Diego EMS
A. Brent Eastman, MD, FACS- SCRIPPS
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San Diego CIREN Centers

Children's Hospital

Palomar Medical Center

Scripps Memorial Hospital

Scripps Mercy Hospital

Sharp Memorial Hospital

University of California, San Diego Medical Center

San Diego County Emergency Medical Services

San Diego CIREN Experience with FY (2/3 Left Frontal) Offset Collisions

- 18 cases 1996 – 2000
- 5 Femur fractures
  - 3 right
  - 2 left
- 5 Pelvis fractures
- 8 Lower extremity fractures (other than Femur)
  - 5 right
  - 3 left
- 5 Upper extremity fractures
  - 2 right
  - 3 left
- Vehicle weights 2400 – 3900 lbs.

INSURANCE INSTITUTE FOR HIGHWAY SAFETY
Frontal Offset Crash Test - Results

BUICK LESABRE
PONTIAC
BONNEVILLE
2000-01 models
OLDSMOBILE
AURORA
2001 models

These models are virtually identical except for their distinguishing styling and trim. Therefore, the crashworthiness ratings apply to each model listed.

Vehicle tested:
2000 Buick LeSabre Custom

Class: Large family car
Weight: 3,558 lbs.

TOP LEFT: Action shot taken during the frontal offset crash test Larger photo

TOP RIGHT: The dummy's position in relation to the steering wheel and instrument panel after the crash test indicates that the driver's survival space was maintained well. Larger photo

BOTTOM LEFT: Smeared greasepaint indicates where the dummy's head contacted the head restraint and shoulder belt housing during rebound. Front lap/shoulder belts are mounted to the seats. Larger photo

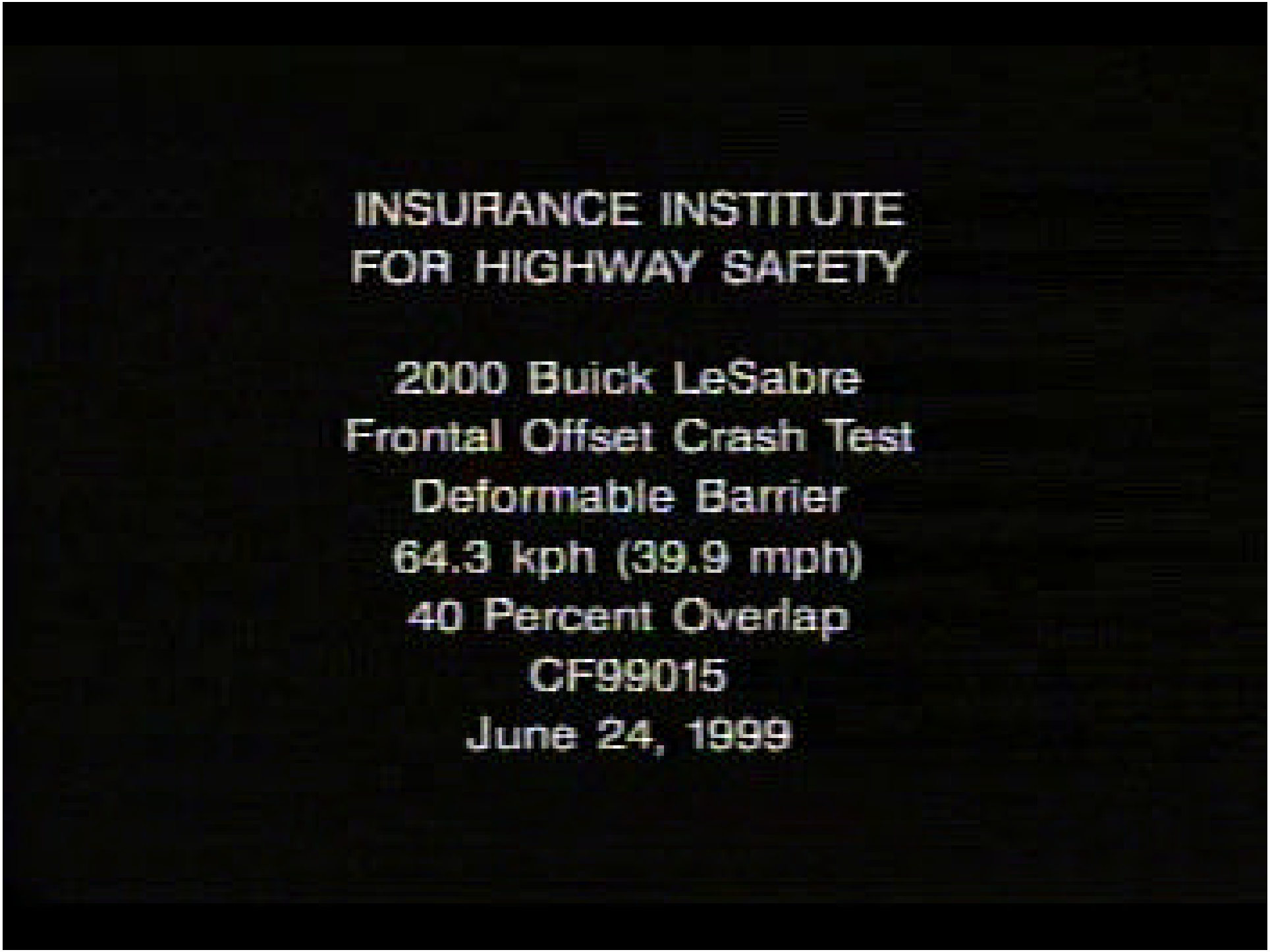
Frontal offset crash test results

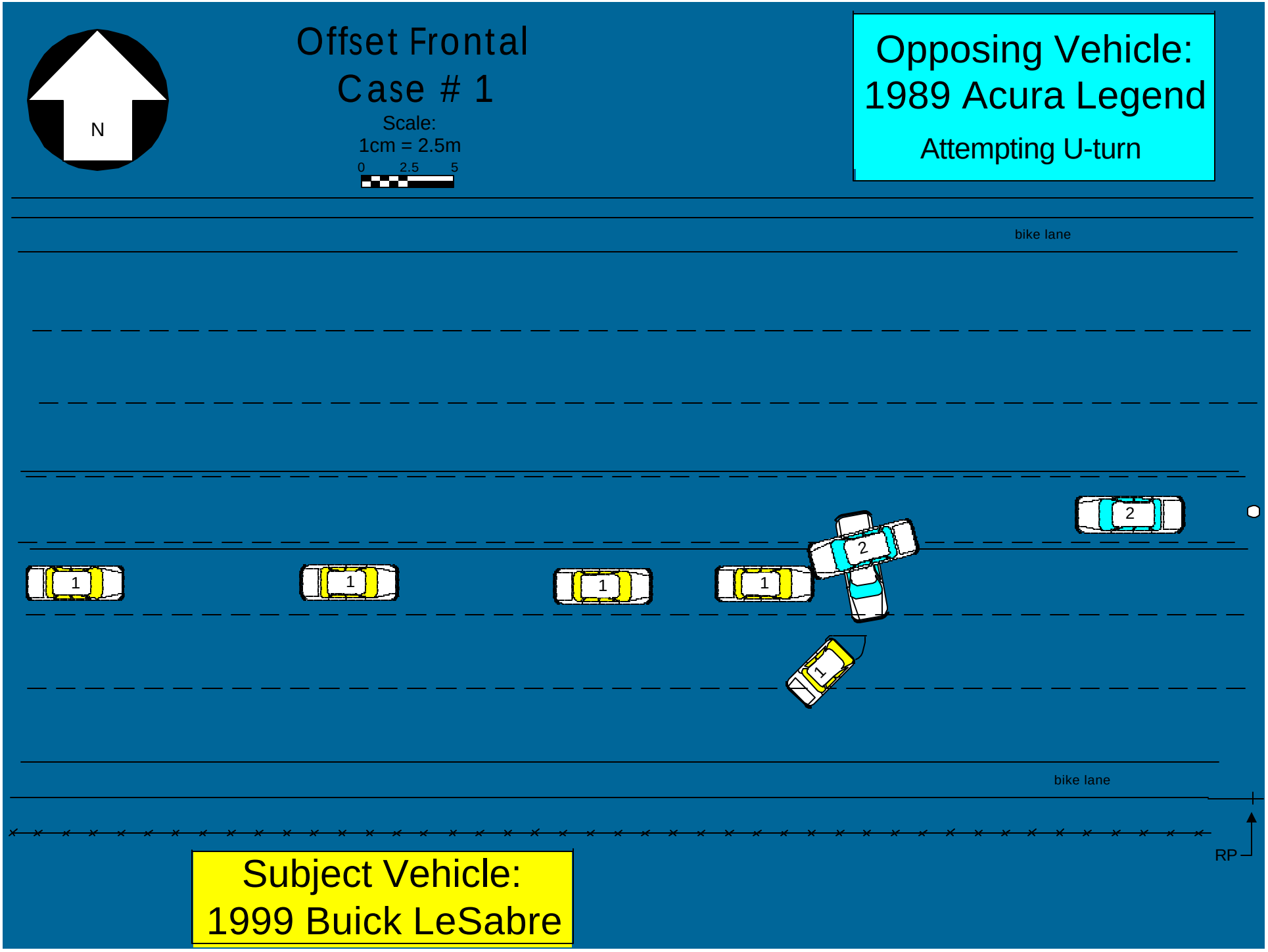
best pick **Overall**	G
Structure/safety cage	G
Injury measures:	
Head/neck	G
Chest	G
Leg/foot, left	G
Leg/foot, right	G
Restraints/dummy kinematics	A

IMPORTANT: Compared with other **large family cars**--compare ratings only among vehicles of similar weight.

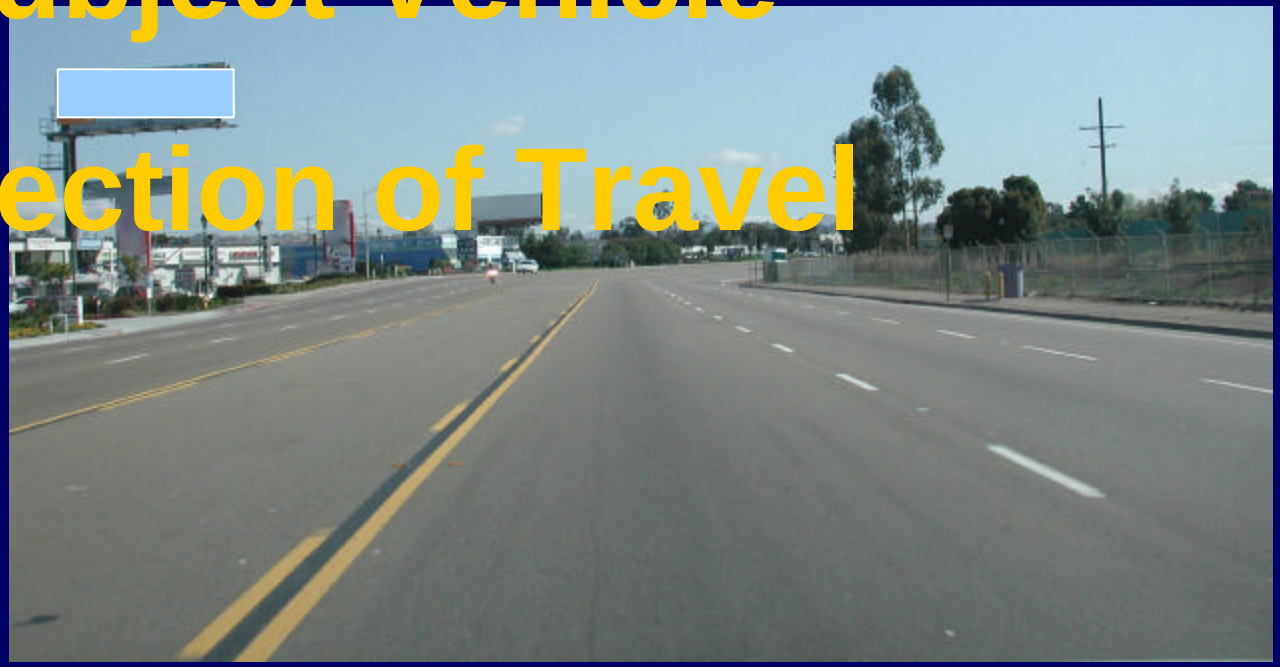
G Good A Acceptable M Marginal P Poor

What is a frontal offset crash


INSURANCE INSTITUTE
FOR HIGHWAY SAFETY
2000 Buick LeSabre
Frontal Offset Crash Test
Deformable Barrier
64.3 kph (39.9 mph)
40 Percent Overlap
CF99015
June 24, 1999


N
Offset Frontal
Case # 1
Scale:
1cm = 2.5m
0
2.5
5
Opposing Vehicle:
1989 Acura Legend
Attempting U-turn
bike lane
bike lane
1
1
1
1
2
2
1
RP
Subject Vehicle:
1999 Buick LeSabre

Subject Vehicle



Direction of Travel

Opposing Vehicle

Direction of Travel

Subject Vehicle

1999 Buick LeSabre

Direct Damage = 60 cm (40% offset)

PDOF = Zero

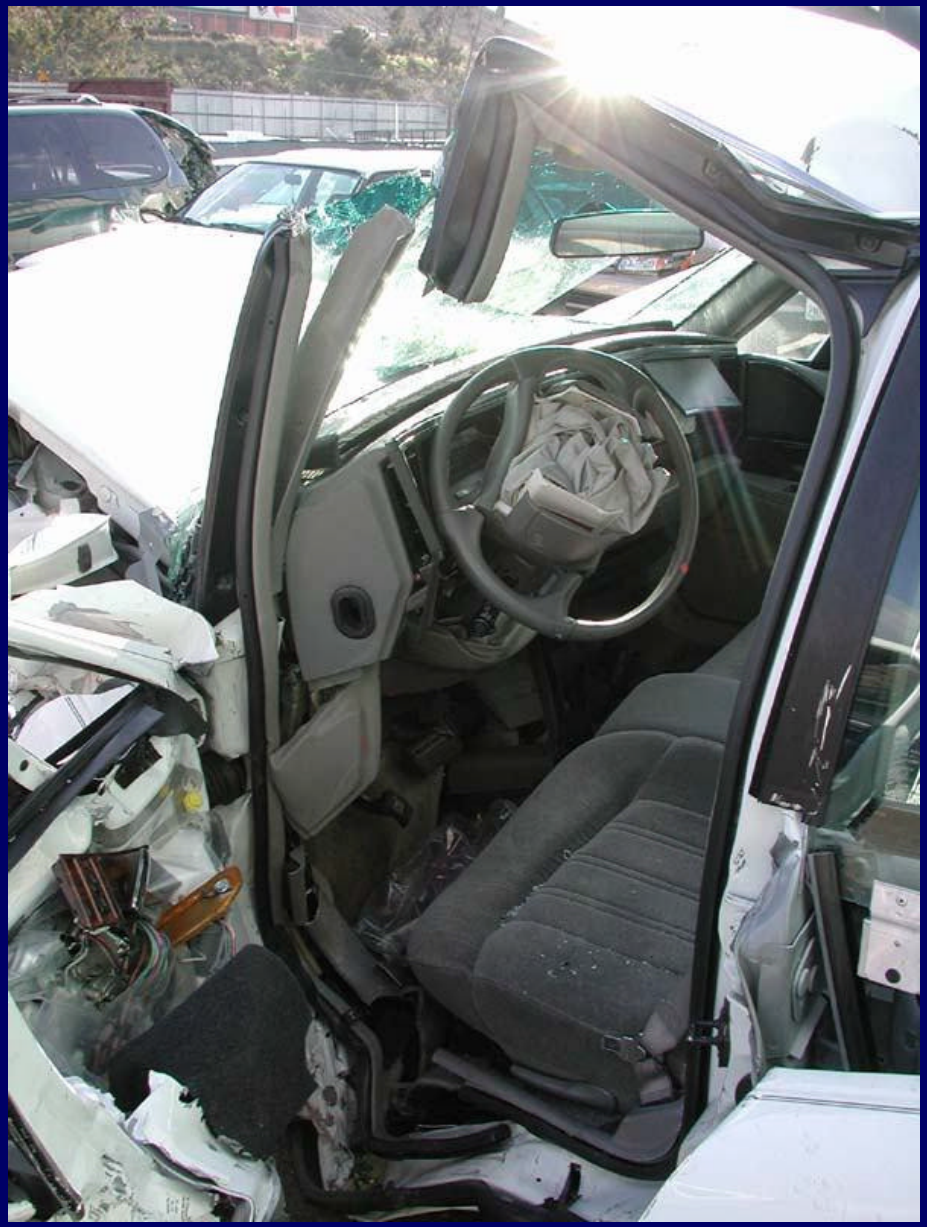
Maximum Crush = 97 cm

WinSmash Delta V (ROLDMISS)

Total = 87.8 kph (55 mph)

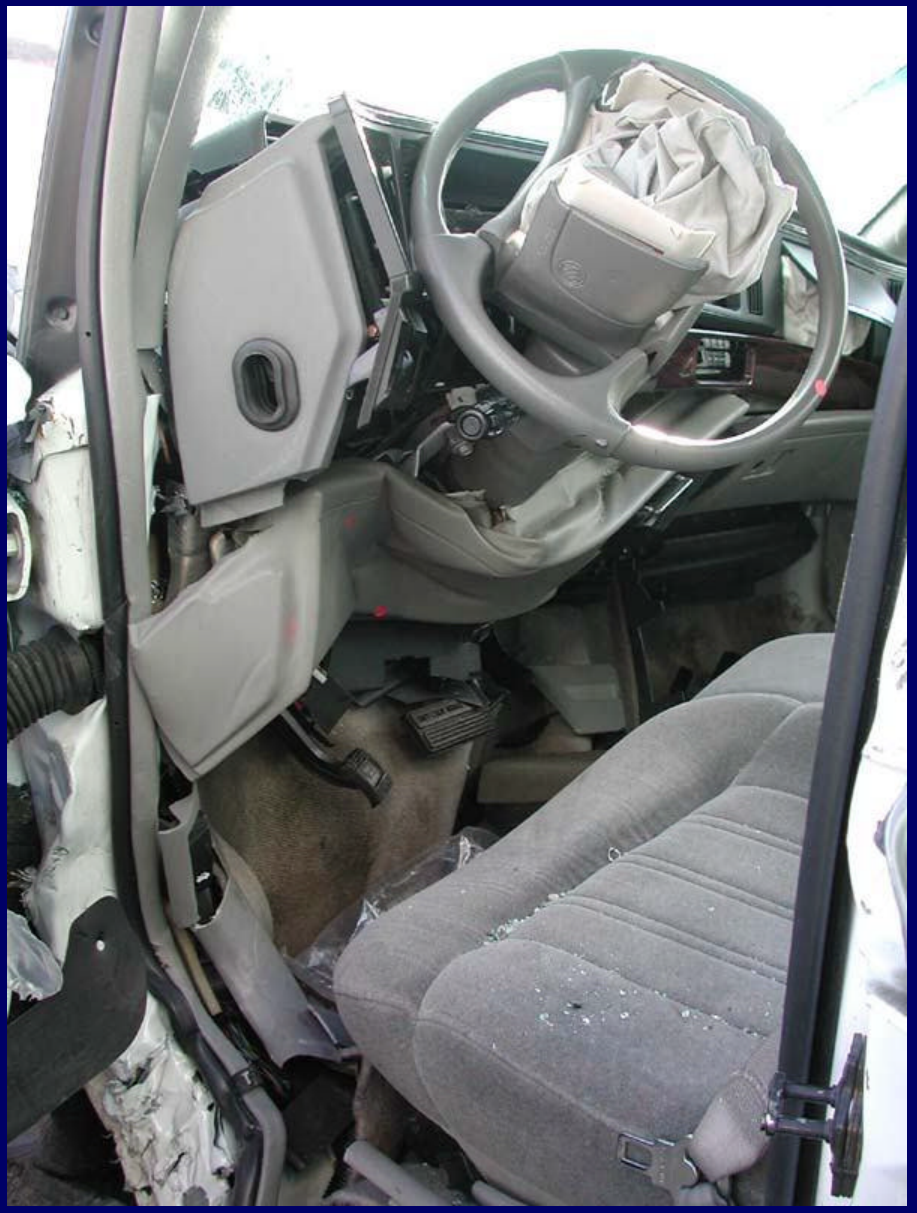
Longitudinal = -87.8 kph

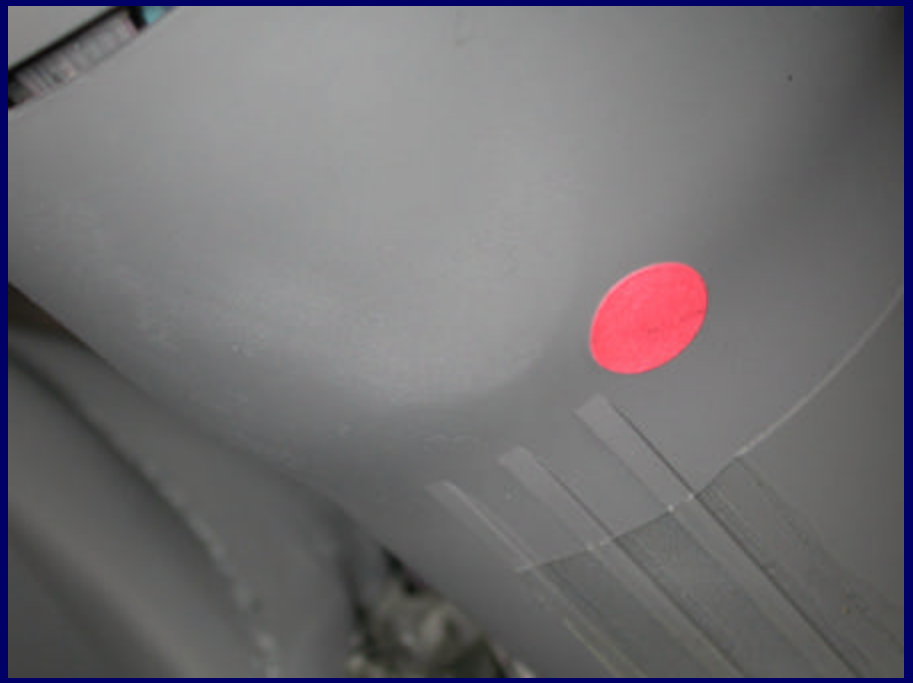
Barrier Equivalent = 69 kph (43 mph)



Intrusions Include:

LF Toe Pan - 28 cm/ LF Dash - 26 cm





Contact Points Include:

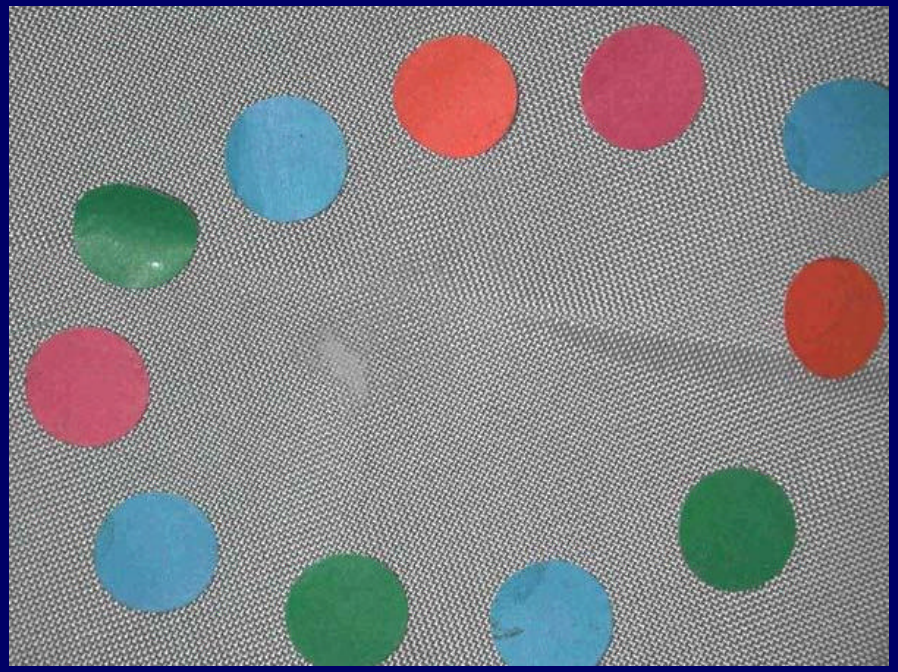
Steering Wheel Rim (deformed)

Steering Column Base (transfer)

Suspected contact to driver door panel
(contaminated during extrication)

Occupant Contact Points (cont:)

Air bag (fluid transfer)



Left shear capsule

Right shear capsule

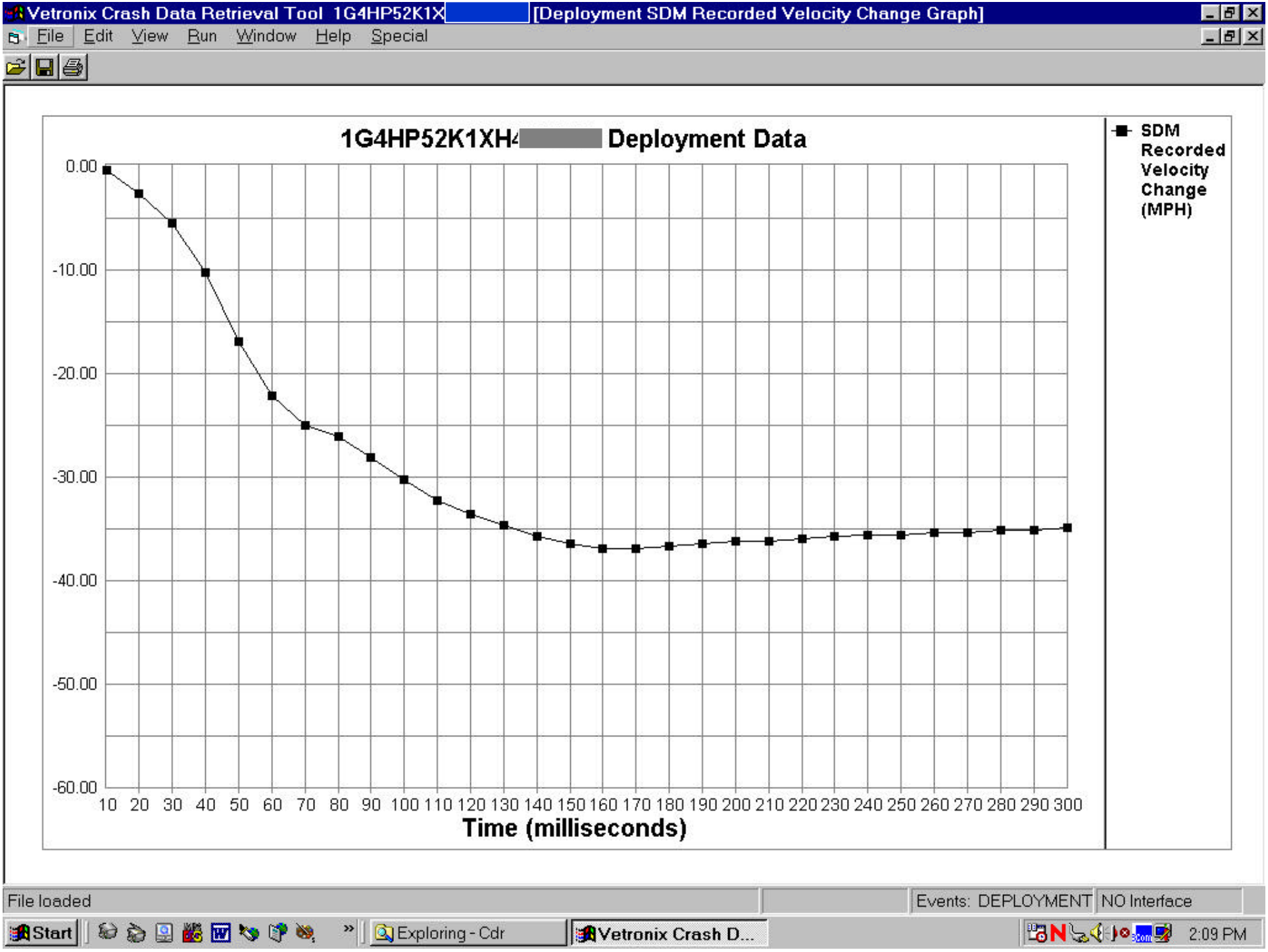
Driver seat, subject's location.

Vetronix Crash Data Retrieval Tool 1G4HP52K1[redacted] - [Deployment Data Summary]

File Edit View Run Window Help Special

1G4HP52K1[redacted] System Status At Deployment	
SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	BUCKLED
Passenger Front Air Bag Suppression Switch Circuit Status	ON
Ignition Cycles At Deployment	3338
Ignition Cycles At Investigation	3340
Time From Algorithm Enable To Deployment Command (msec)	10
Time From Near Deployment To Deployment (msec)	N/A

Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Recorded Velocity Change (MPH)	-0.44	-2.63	-5.49	-10.31	-16.89	-22.16	-25.01	-26.11	-28.08	-30.28	-32.25	-33.57	-34.67	-35.76	-36.42
Time (milliseconds)	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
Recorded Velocity Change (MPH)	-36.86	-36.86	-36.64	-36.42	-36.20	-36.20	-35.98	-35.76	-35.54	-35.54	-35.32	-35.32	-35.10	-35.10	-34.88


Vetronix Crash Data Retrieval Tool 1G4HP52K1X [Deployment SDM Recorded Velocity Change Graph]
File Edit View Run Window Help Special
1G4HP52K1XH[redacted] Deployment Data
SDM Recorded Velocity Change (MPH)
0.00
-10.00
-20.00
-30.00
-40.00
-50.00
-60.00
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300
Time (milliseconds)
File loaded
Events: DEPLOYMENT
NO Interface
Start
Exploring - Cdr
Vetronix Crash D...
2:09 PM

Vehicle Occupant

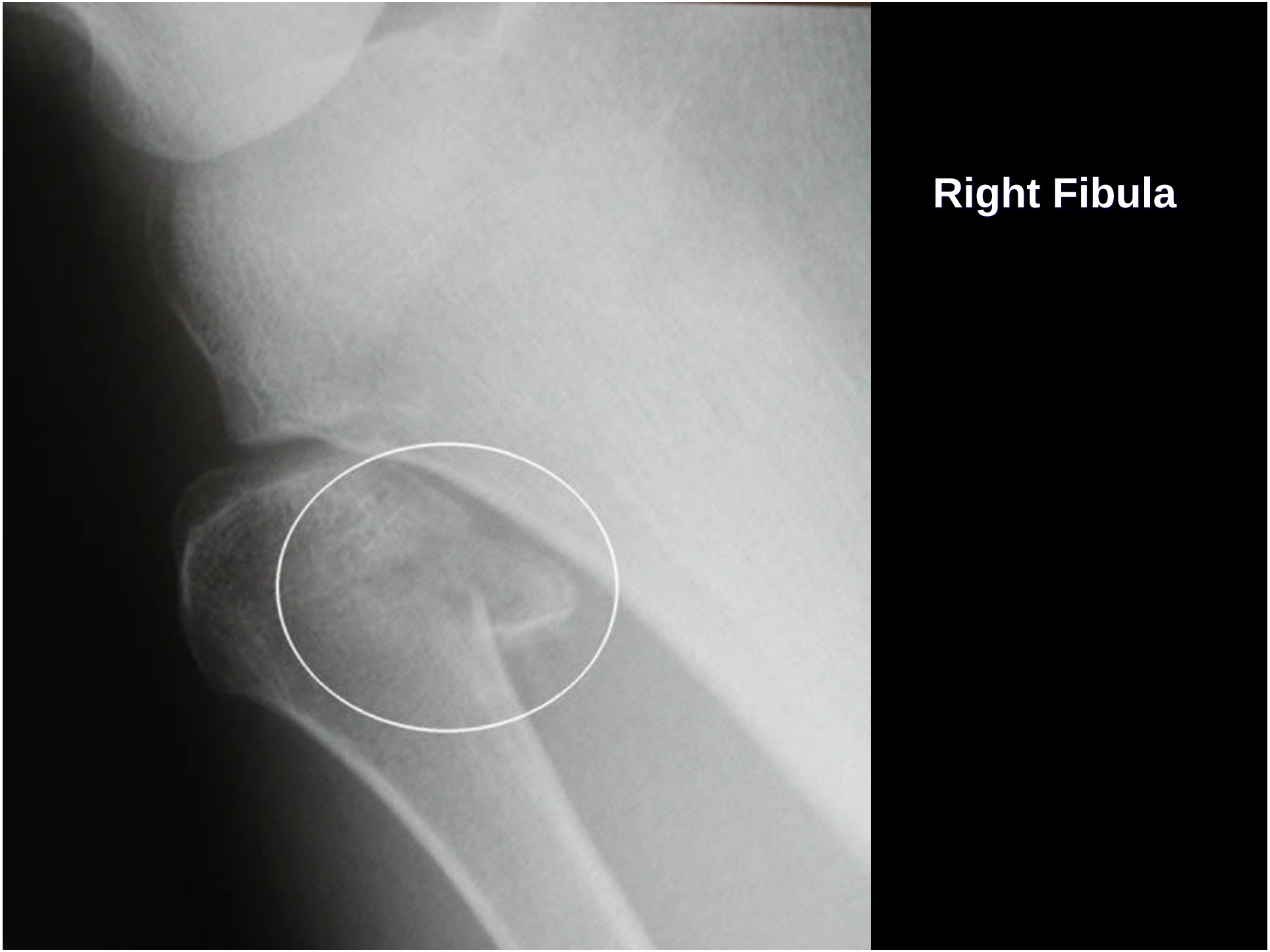
- 39 year old male
- Restrained Driver
  - Lap/Shoulder belt
  - Airbag
- 6 feet, 190 pounds
- Wearing sunglasses
- Full recall of crash

Patient Injuries

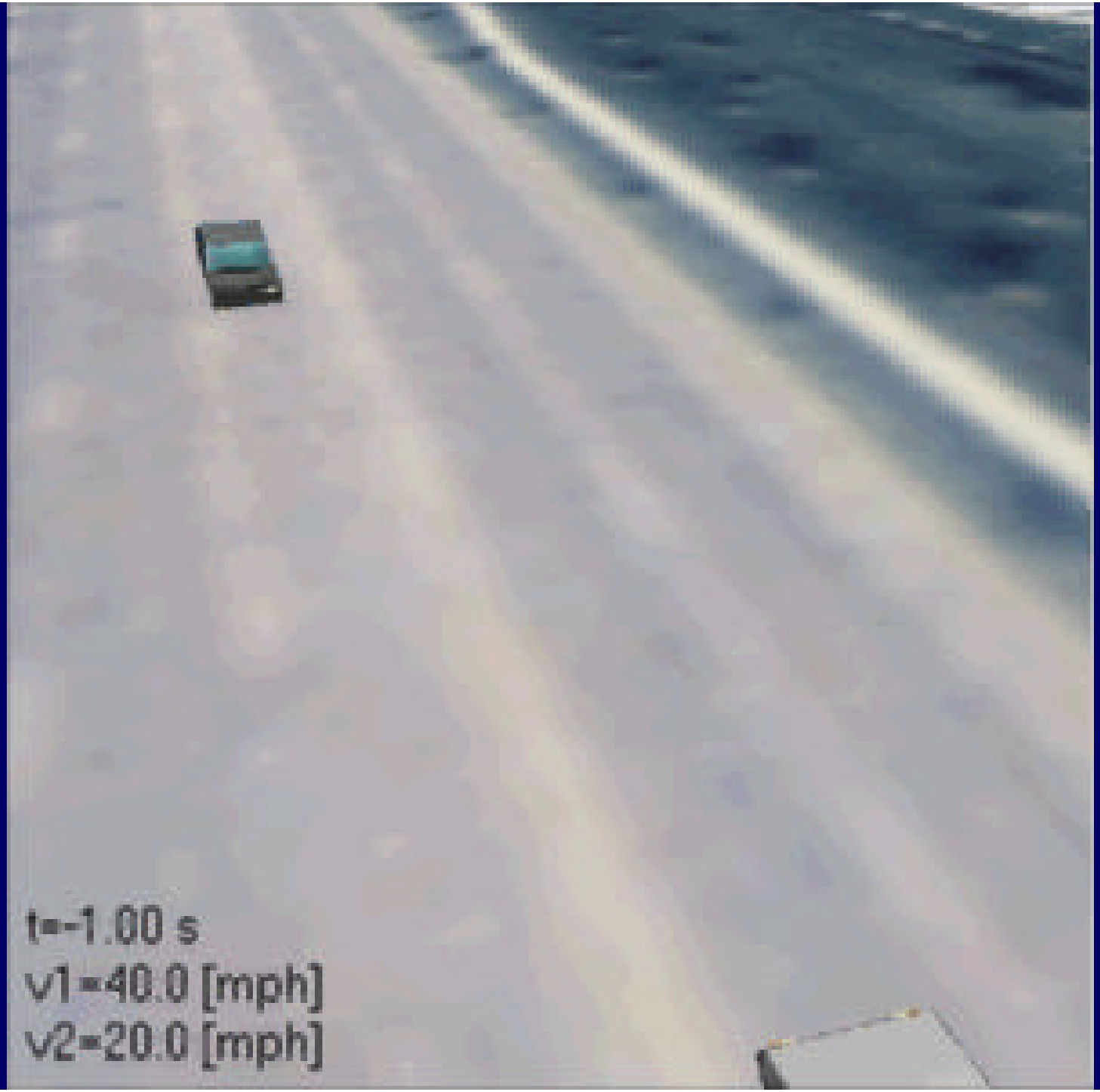
- Left humerus fracture – distal shaft with radial nerve palsy
- Right midshaft femur fracture
- Right comminuted fibular head fracture
- Right elbow contusion
- Bilateral shin contusions
- Right thigh, knee, and ankle contusion
- Left lateral ankle contusion

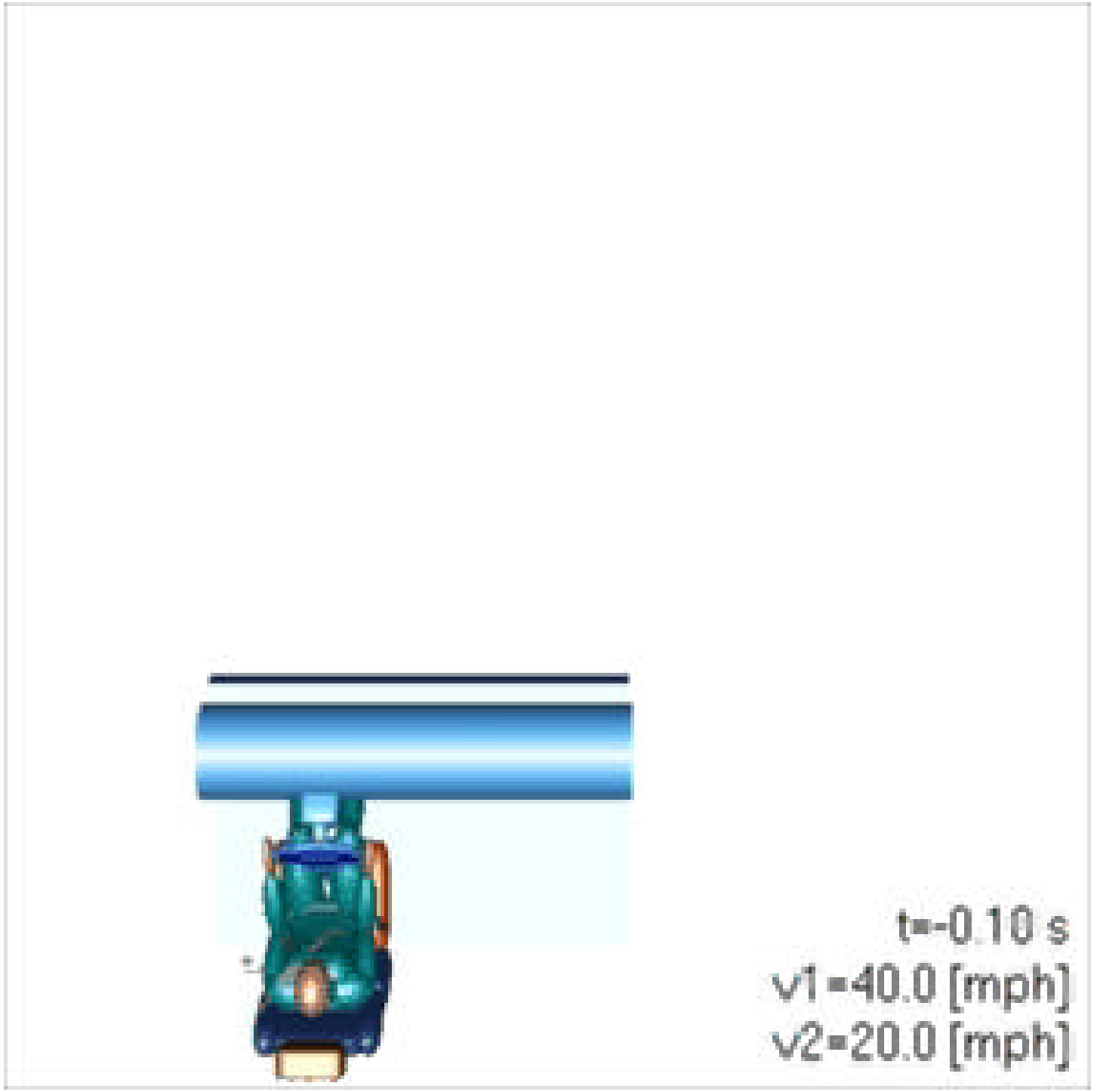
Left Humerus

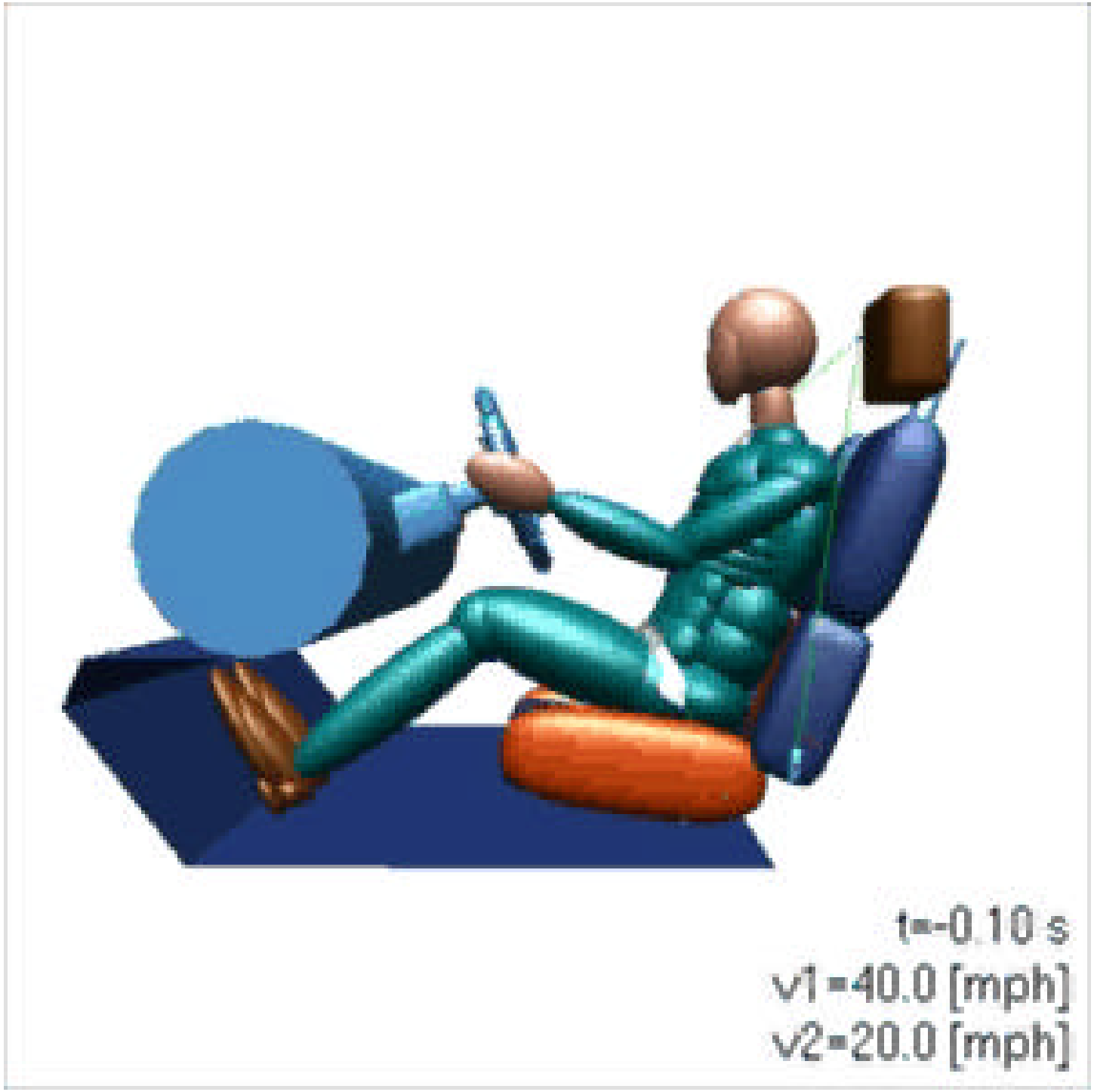
Right Femur



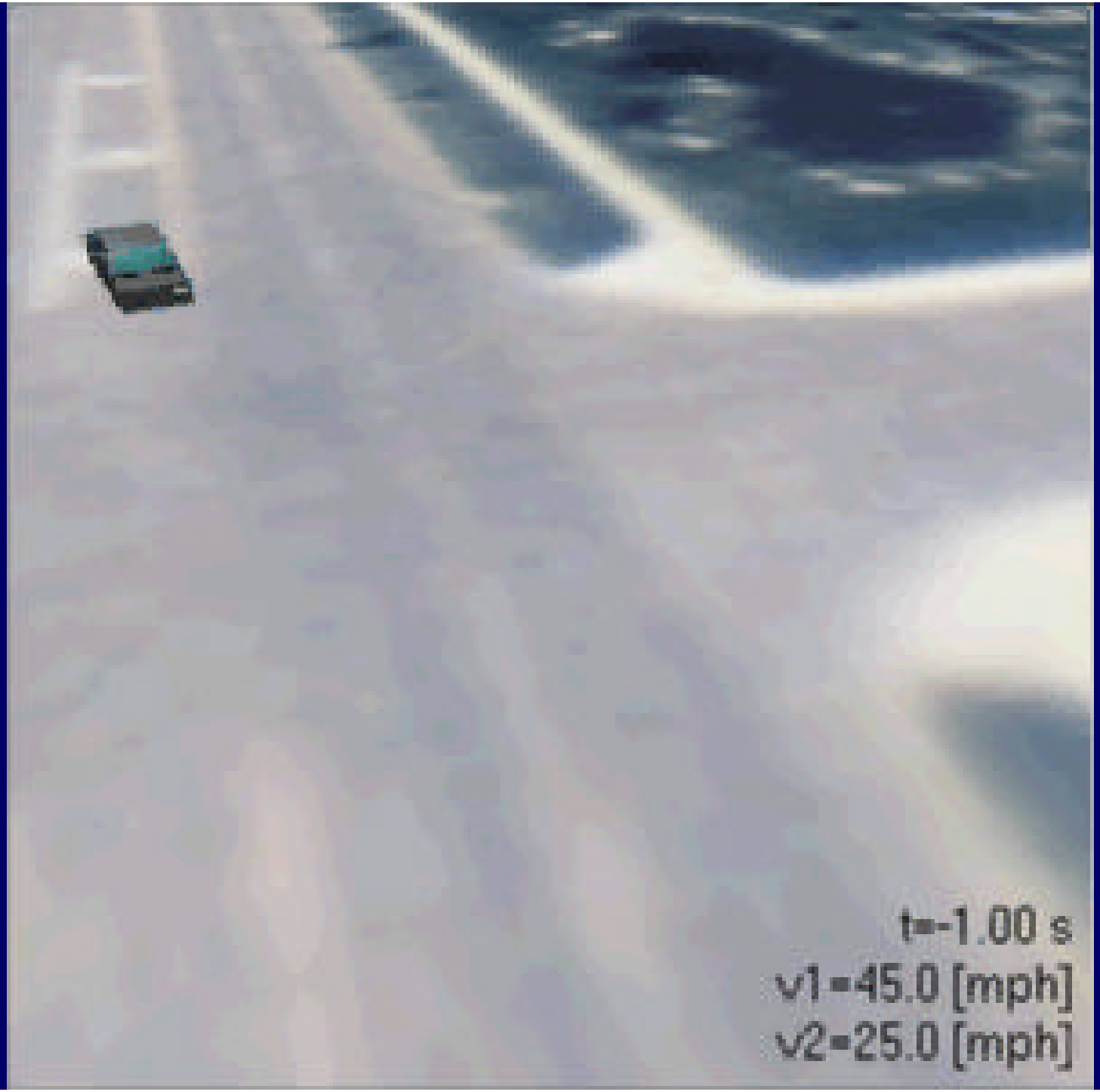
Right Fibula

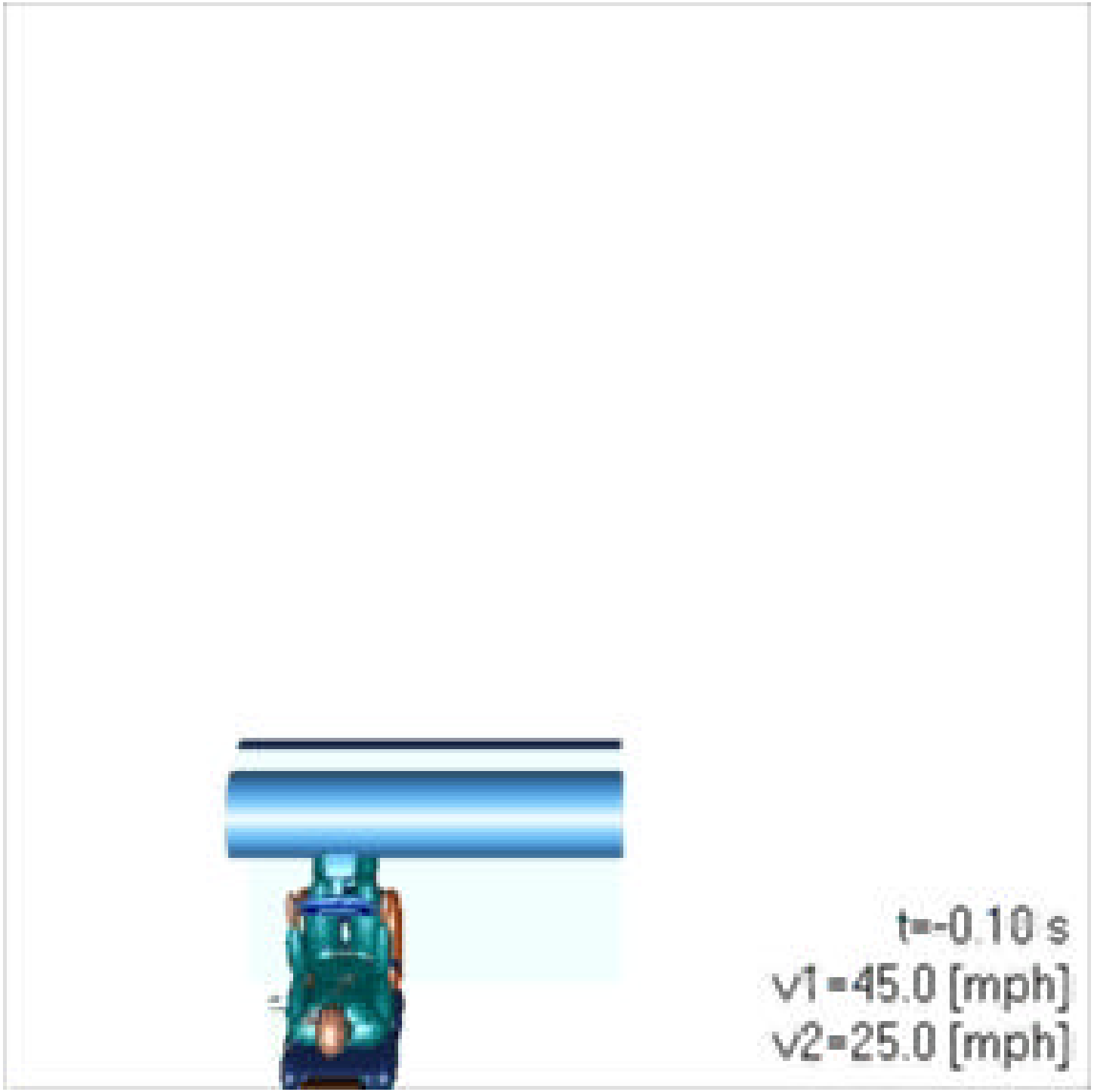

t=-1.00 s
v1=40.0 [mph]
v2=20.0 [mph]

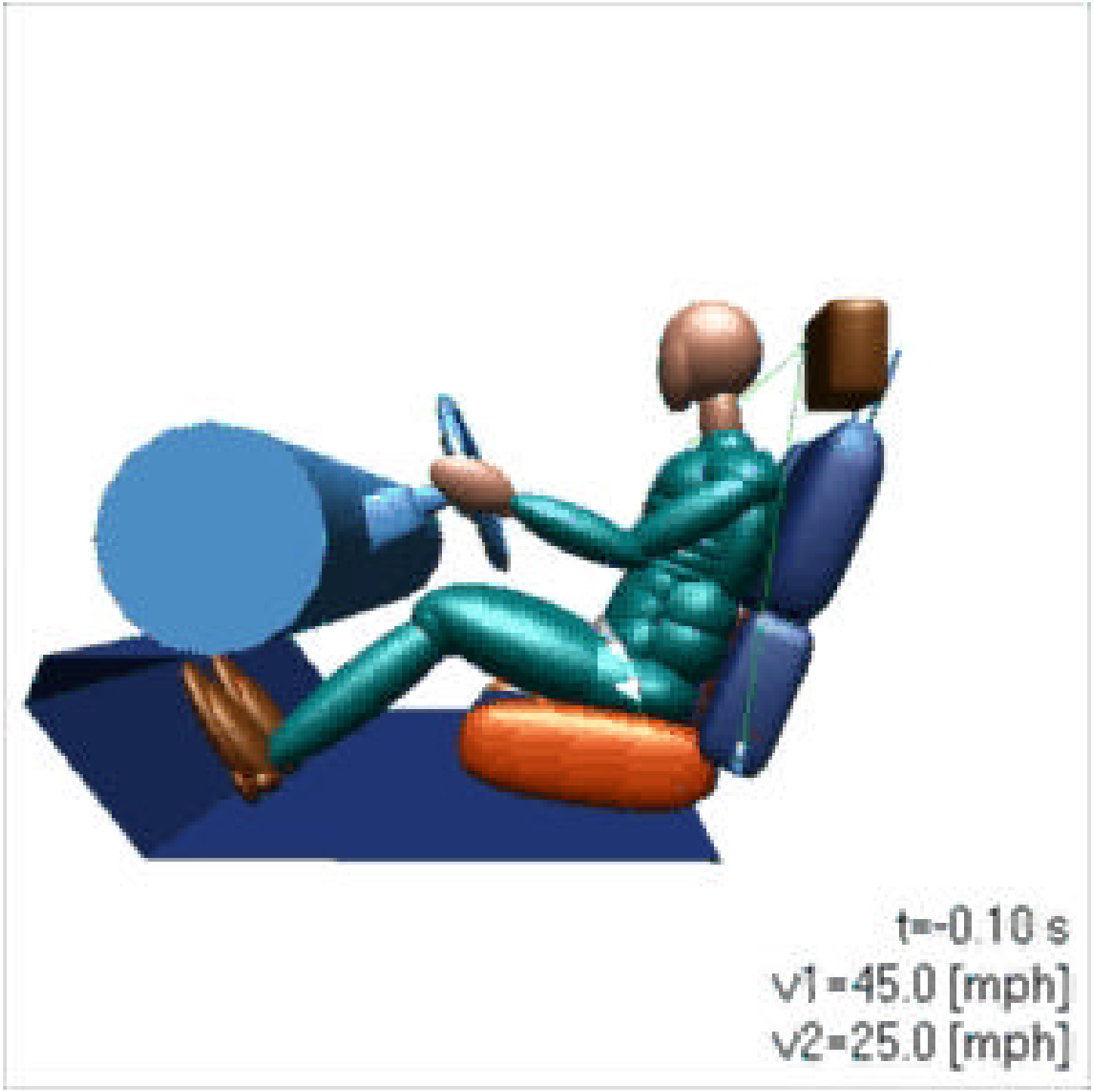

t=-0.10 s
v1=40.0 [mph]
v2=20.0 [mph]


t=-0.10 s
v1=40.0 [mph]
v2=20.0 [mph]

Frontal Offset (FY) Collision with Clockwise Rotation


t=-1.00 s
v1=45.0 [mph]
v2=25.0 [mph]

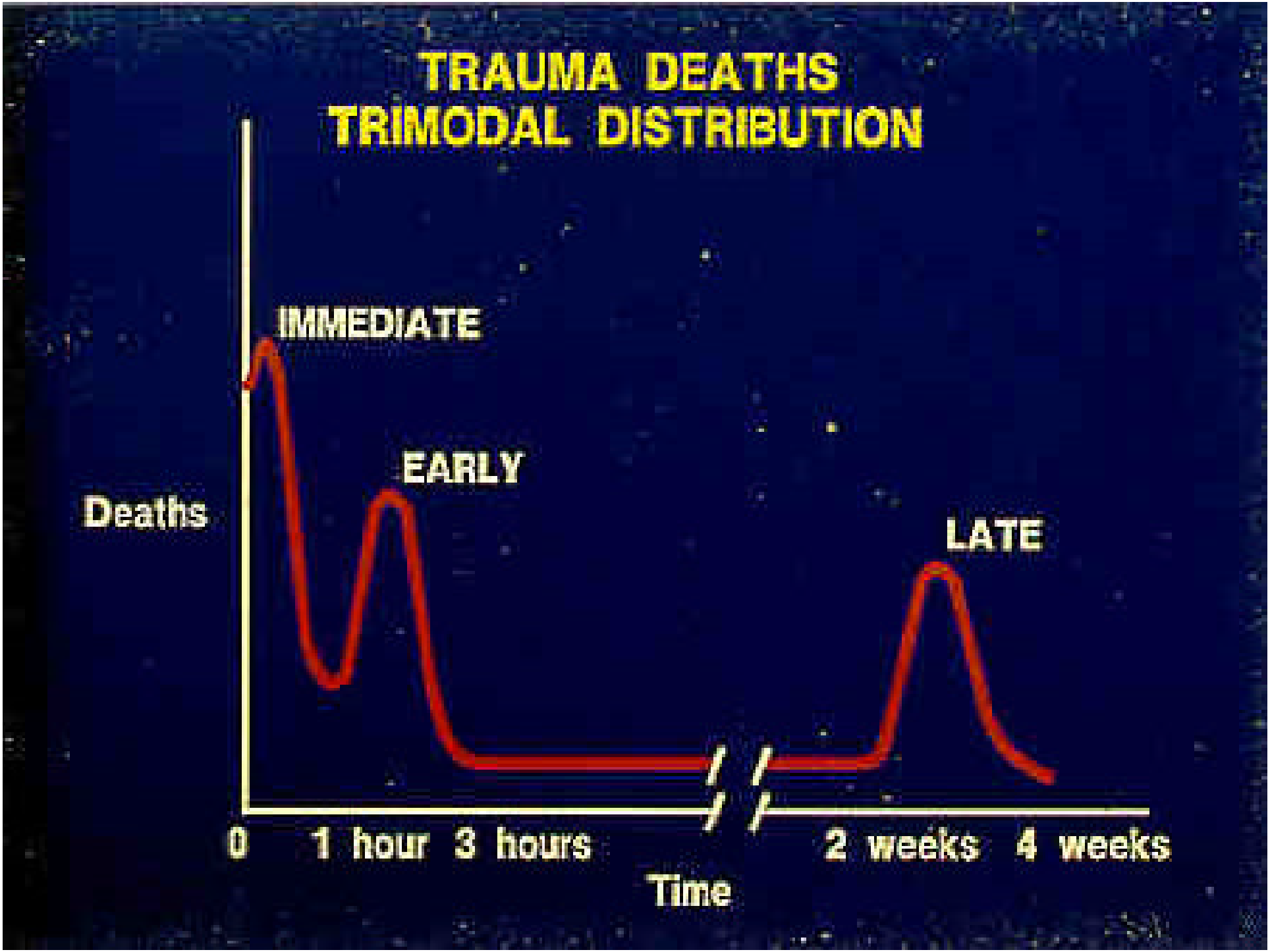

t=-0.10 s
v1=45.0 [mph]
v2=25.0 [mph]


t=-0.10 s
v1 =45.0 [mph]
v2=25.0 [mph]

TRAUMA IS NO ACCIDENT

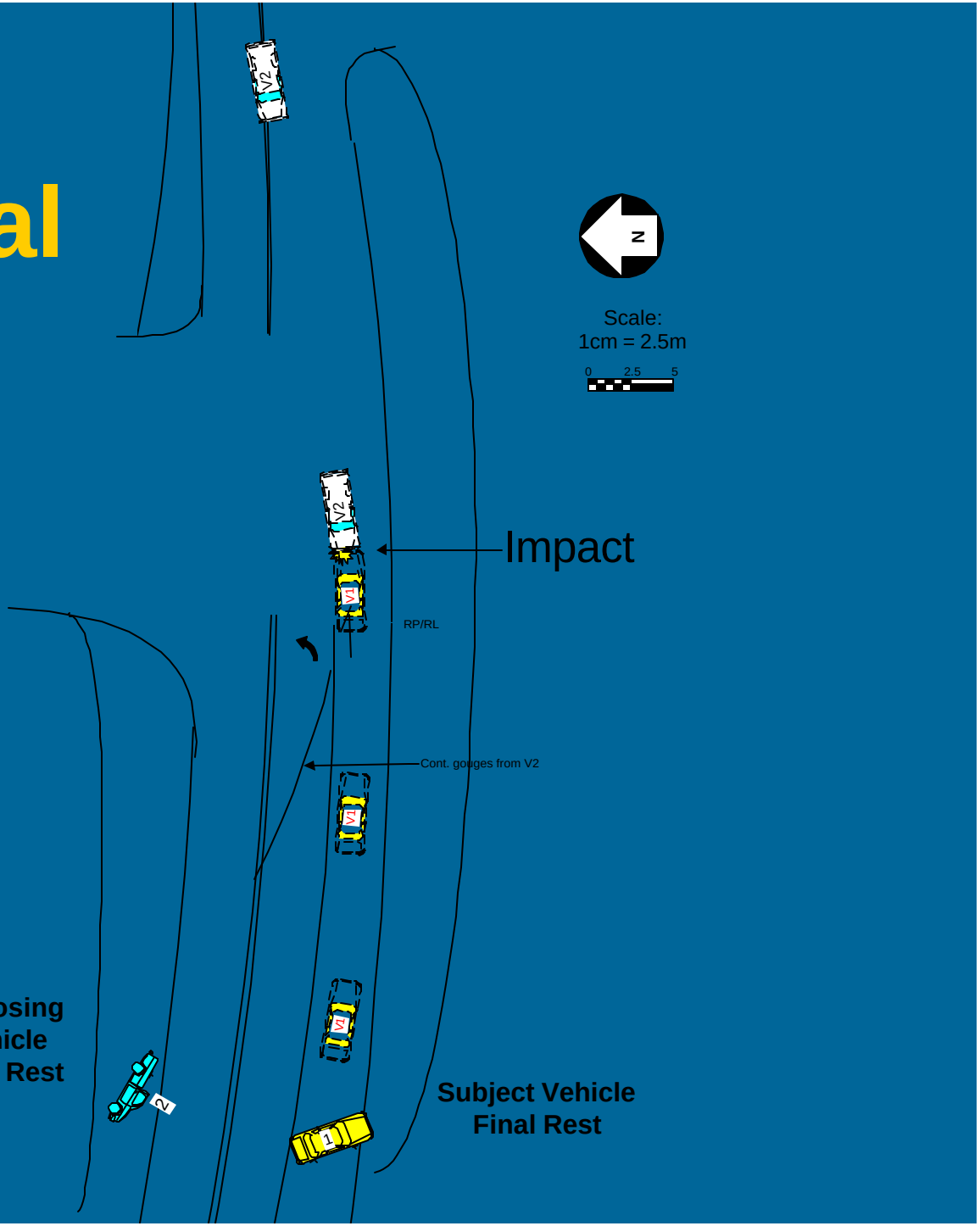
Think of Trauma as a Disease

- It has a cause
- It has a cure
- And it can be PREVENTED !


TRAUMA DEATHS
TRIMODAL DISTRIBUTION
IMMEDIATE
EARLY
LATE
Deaths
0
1 hour
3 hours
2 weeks
4 weeks
Time

Offset Frontal

Case #2




Opposing Vehicle
Direction of Travel


Subject Vehicle
Direction of Travel

Subject Vehicle

Maximum Crush

104 cm

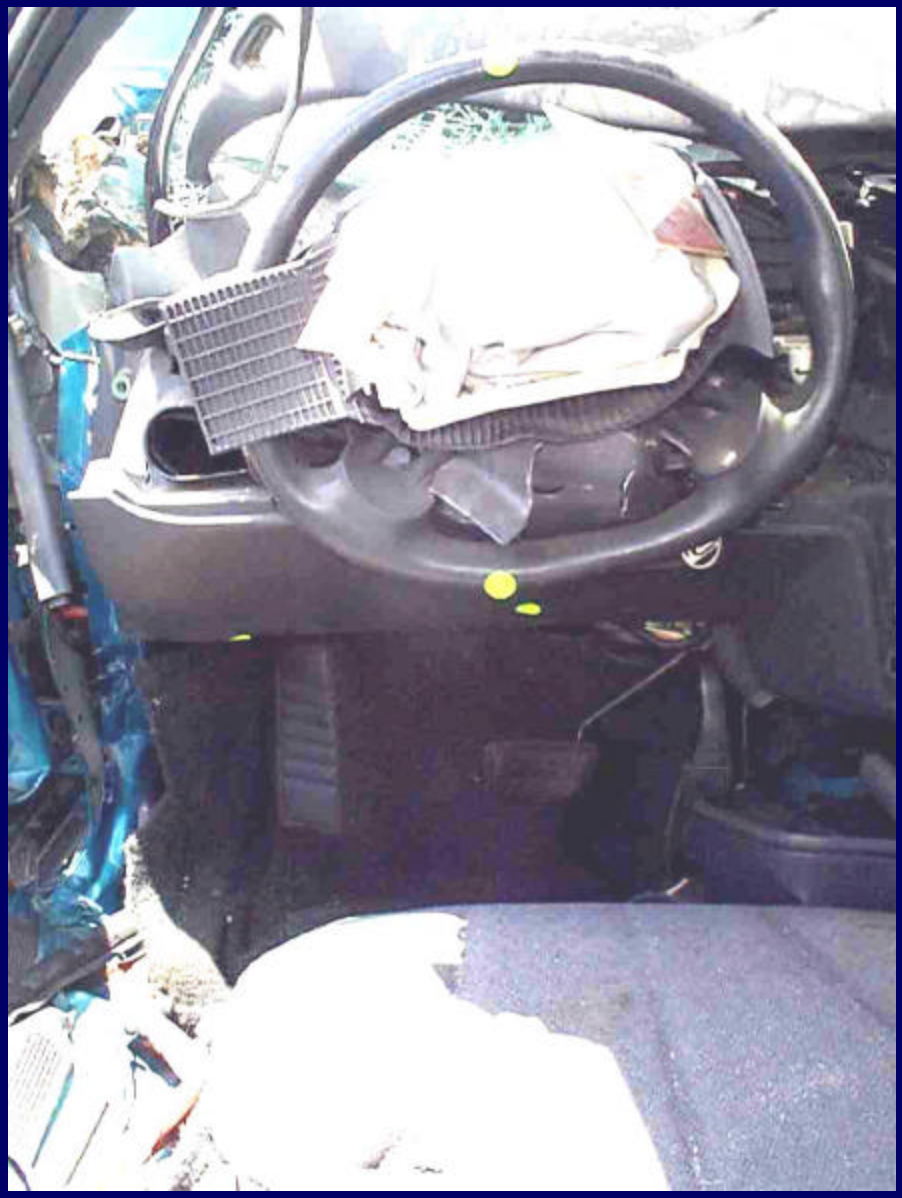
PDOF –10 degrees

Total Delta V (ROLDMISS)

68 kph (42 mph)*

Intrusion

Occupant Contact



Restraints

Vehicle Occupant

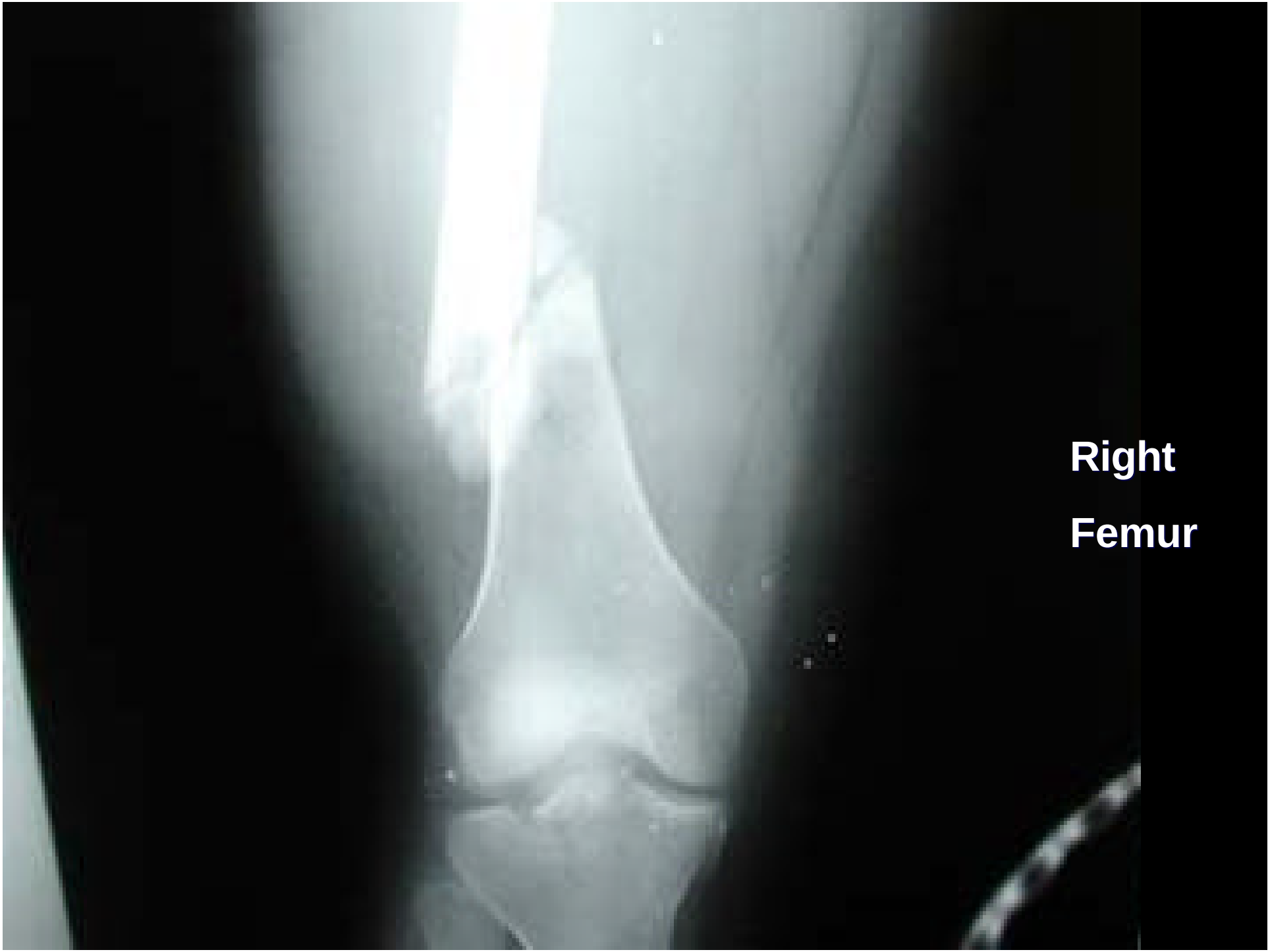
- 20 year old female
- Restrained Driver
  - Lap/Shoulder belt
  - Airbag
- 5 ft 5 in, 151 lbs

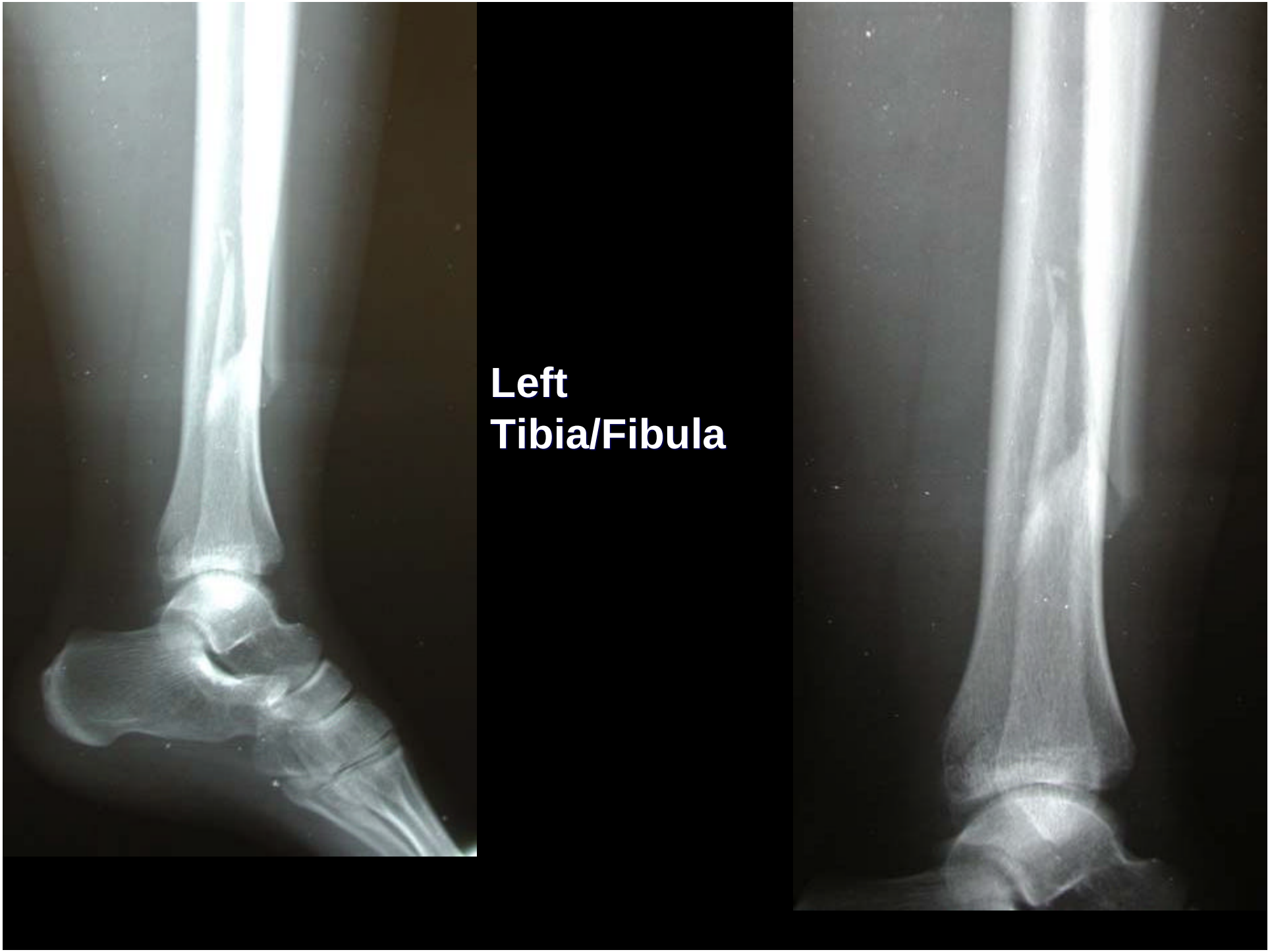
Patient Injuries

- Atlanto-occipital fracture dislocation
- Spinal cord transection
- Fracture-separation C3-C4 vertebrae
- Bilateral lung contusions, minor
- Liver laceration, 3 capsular
- Spleen laceration, 2 capsular
- Right forearm fracture
- Right and left femur fractures
- Right & left fibula fractures
- Right ankle fracture

Right Radius/Ulna

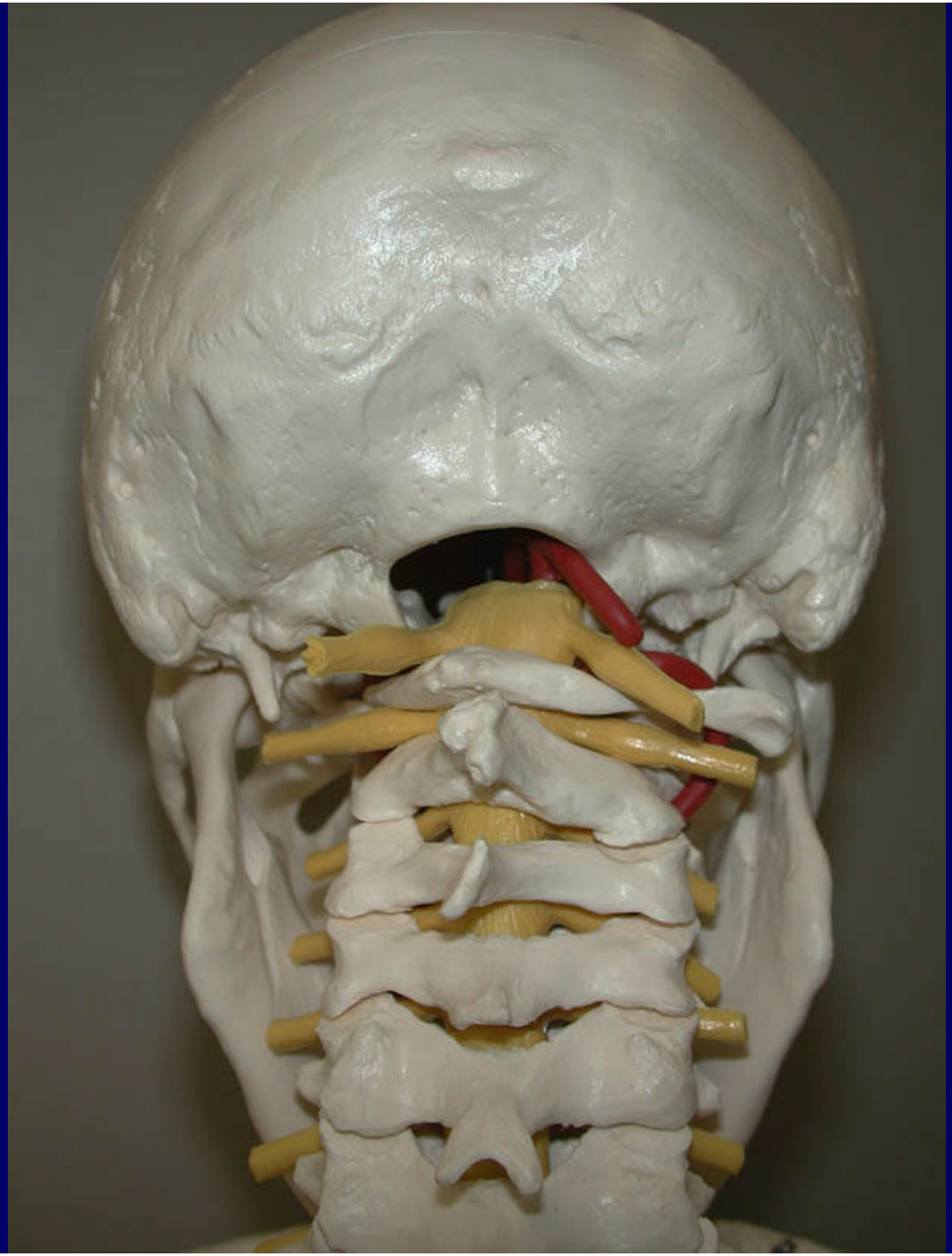

Left
Femur

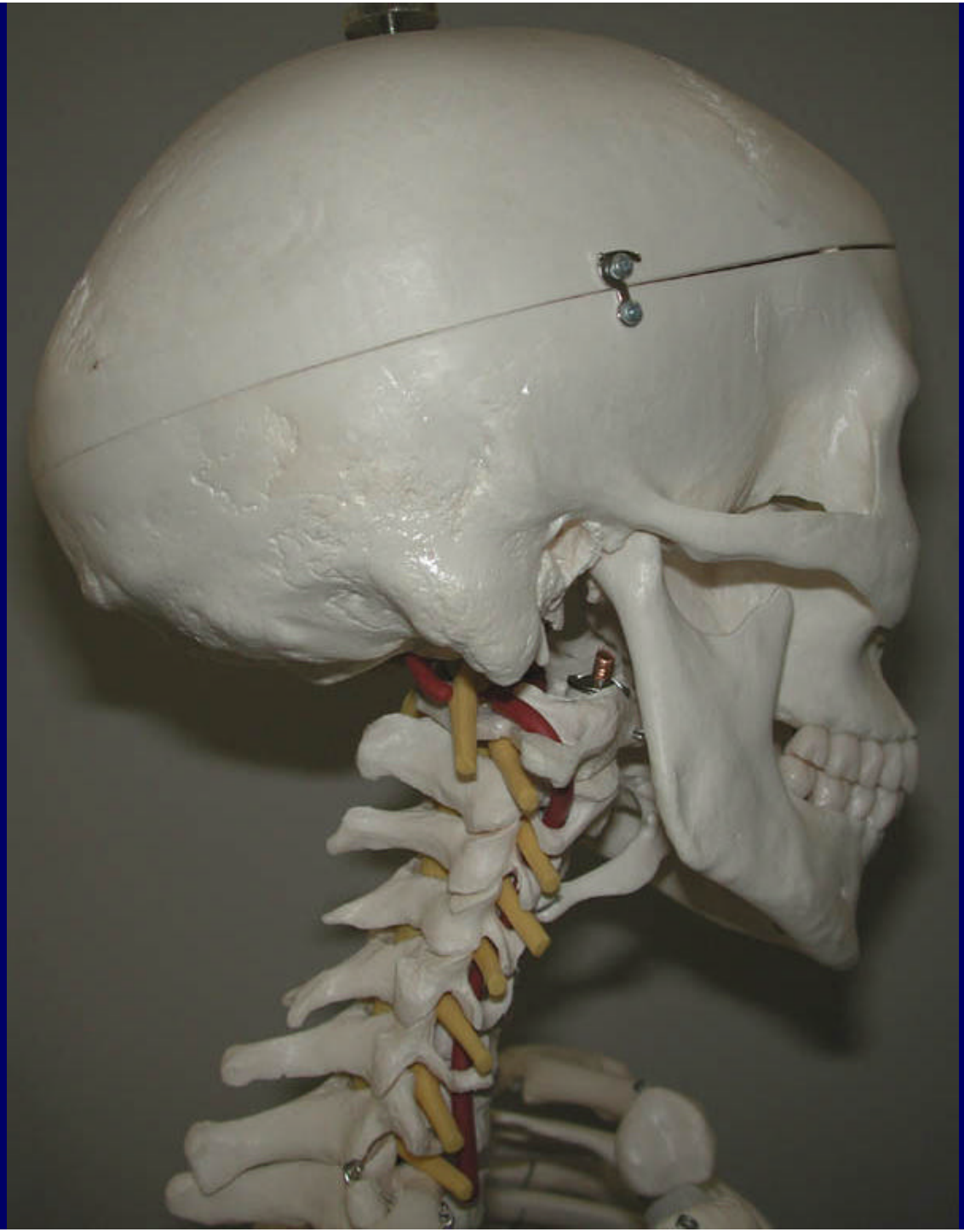

Right
Femur


Left
Tibia/Fibula

Right Tibia/Fibula

Atlanto-Occipital Dislocation





Atlanto-Occipital Dislocation